CLAIMS:

We claim:

1. A system for detecting changes in the properties of a polymeric material, the system comprising:

a frame held against the outside surface of a curved polymeric test specimen;

a transmitting probe attached to said frame, wherein the transmitting probe may emit critically refracted ultrasonic waves that travel longitudinally across the chord of said curved test specimen;

at least one receiving probe attached to said frame, wherein said receiving probe detects said critically refracted ultrasonic waves; and

a data processing system that measures the travel time of said critically refracted ultrasonic waves from the transmitting probe to the receiving probe and compares said measured travel time to an expected travel time, wherein the speed of said ultrasonic waves is affected by variations in material properties along the penetration path of the ultrasonic waves.

2. The system according to claim 1, further comprising:

at least one thermocouple attached to said frame that measures the temperature of the surface of said curved polymeric test specimen, wherein said temperature measurement is sent to said data processing system, wherein said measured travel time of the ultrasonic waves is adjusted to account for the effects of temperature.

3. The system according to claim 1, wherein the distance between said transmitting probe and said receiving probe may be adjusted.

4. The system according to claim 1, wherein the frequency of said critically refracted ultrasonic waves may be adjusted.

5. The system according to claim 1, wherein said transmitting probe and said receiving probe contain silicone cores through which the critically refracted ultrasonic waves travel.

6. The system according to claim 1, wherein the curved polymeric test specimen is a container.

7. A method for detecting changes in the properties of a polymeric material, the method comprising:

holding a frame against the outside surface of a curved polymeric test specimen;

emitting critically refracted ultrasonic waves from a transmitting probe attached to said frame, wherein said waves travel longitudinally across the chord of said curved test specimen;

detecting said critically refracted ultrasonic waves with at least one receiving probe attached to said frame; and

measuring the travel time of said critically refracted ultrasonic waves from the transmitting probe to the receiving probe and comparing said measured travel time to an expected travel time, wherein the speed of said ultrasonic waves is affected by variations in material properties along the penetration path of the ultrasonic waves.

8. The method according to claim 7, further comprising:

measuring the temperature of the surface of said curved polymeric test specimen with at least one thermocouple attached to said frame; and

adjusting said measured travel time of the ultrasonic waves to account for the effects of temperature.

9. The method according to claim 7, wherein the distance between said transmitting probe and said receiving probe may be adjusted.

10. The method according to claim 7, wherein the frequency of said critically refracted ultrasonic waves may be adjusted.

11. The method according to claim 7, wherein said transmitting probe and said receiving probe contain silicone cores through which the critically refracted ultrasonic waves travel.

12. The method according to claim 7, wherein the curved polymeric test specimen is a container.

13. A computer program product, in a computer readable medium, for detecting changes in the properties of a polymeric material, the computer program product comprising:

first instructions for measuring the travel time of critically refracted ultrasonic waves from a transmitting probe to a receiving probe, wherein said waves travel longitudinally across the chord of a curved polymeric test specimen;

second instructions for comparing said measured travel time to an expected travel time, wherein the speed of said ultrasonic waves is affected by variations in material properties along the penetration path of the ultrasonic waves.

14. The computer program product according to claim 13, further comprising:

third instructions for measuring the temperature of the surface of said curved polymeric test specimen; and

fourth instructions for adjusting said measured travel time of the ultrasonic waves to account for the effects of temperature.

15. The computer program product according to claim 13, wherein the curved polymeric test specimen is a container.

16. The computer program product according to claim 15, further comprising

third instructions for receiving data about the contents of said container;

fourth instructions for adjusting said measured travel time of the ultrasonic waves to account for mechanical stress caused by said contents.